Brantly Substation transformer information.

Transformer to be supplied by SPX

Via, Gary

From: Sibley, Craig
Sent: Wednesday, January 07, 2015 8:41 AM
To: Via, Gary
Subject: FW: Order Acknowledgement GT-02220 Danville Power & Light | PO 24164
Attachments: 2220-OA-SUM.pdf; Quote 70004100 City of Danville.pdf; 70004100-10-QPS.pdf

Gary,

The first attachment is the order acknowledgement and pages 17 & 18 of the second attachment list the manufactures assembly responsibilities. I think this will clarify work to be done in the bid package.

From: Jordan Tyler [mailto:jtyler@bradleyelectro.com]
Sent: Monday, January 05, 2015 1:51 PM
To: Sibley, Craig
Subject: FW: Order Acknowledgement GT-02220 Danville Power & Light | PO 24164

Craig,

Here is the original quote. Please look over it carefully as it details warranty, installation, and storage. I think I am going to try to come down there in a couple days. Let me know if that works for you. Thanks.

Jordan Tyler
Bradley Electro Sales Corp.
Western Virginia & W. Virginia
(540)-797-4040- Cell

ORDER ACKNOWLEDGEMENT

05/02/2014 12:05:45

SPX TRANSFORMER SOLUTIONS

SOLD TO:

DANVILLE POWER & LIGHT
PO Box 3300
DANVILLE VA 24543
USA

SHIP TO:

DANVILLE POWER & LIGHT
BRANTLY SUBSTATION
UTILITY SERVICE CENTER
1040 MONUMENT ST
DANVILLE VA 24541
USA

Project Number:	**Order Number:**
GT-02220	2220
Purchase Order Number:	**Purchase Order Date:**
P024164	04/11/2014
Order Date:	**Quote Number:**
05/02/2014	70004100
Specification No:	**Specification Date:**
BRANTLEY SUB 18/24/30	02/20/2014
Estimated Shipping Date:	**Warranty:**
10/03/2014	5 Year Warranty

Bradley Electro Sales Corp.	**Sales Contact**	**Contact Phone**	**Contact Email**
Sales Representative	Jordan Tyler	540-797-4040	jtyler@bradleyelectro.com
SPX Transformer Solutions	**Contact**	**Phone**	**Email**
Order Coordinator	Meredith Adams	919-580-3255	meredith.adams@spx.com
Project Manager	Stephen Perkins	919-581-1645	stephen.perkins@spx.com
Warranty Manager	Roy Davis	919-580-3215	roy.davis@spx.com

Item No	Specification	Quantity Ordered	Amount
10	Transformer, 18.000/24.000/30.000, 69.000kVD-12.470kVY, 3 phase, 65/65C,UZD LTC	1.00	$525,785.00

Approval drawing scheduled due date: 07/21/14

Subtotal before Taxes: $525,785.00

Unit will be Designed, Manufactured, Tested, Shipped, Sold, and Invoiced in accordance with Waukesha Electric Systems Quotation.

SPX Transformer Solutions, Inc. Terms and Conditions of Sale apply to this order unless other terms have been agreed upon in writing by Waukesha and Buyer.

Please advise within five (5) business days if estimated ship date or delivery date is not acceptable.

SPX Waukesha will provide all labor and equipment to assemble this transformer, vacuum fill (if applicable), test in accordance with our standard field installation policy and procedures, and to facilitate activation of the applicable warranty. Unless specifically noted, prices do not include the use of union labor.

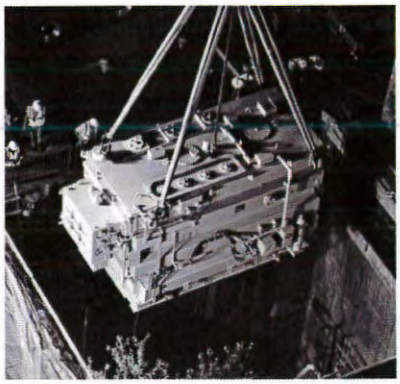
To schedule this work, please contact our service department at least three (3) weeks in advance of the planned start date by calling 1-800-758-4384 and ask for Field Service Department.

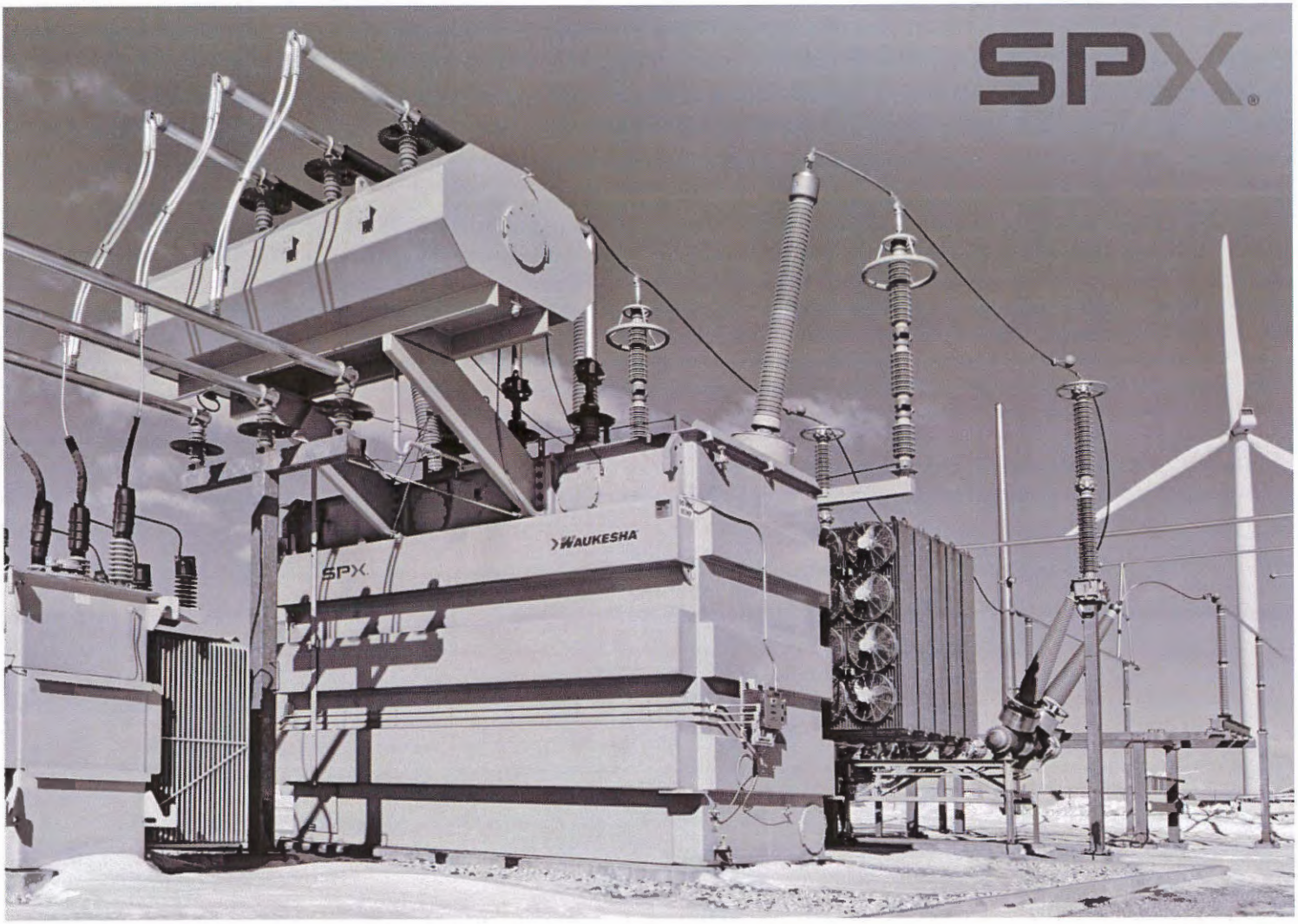
If this order is taxable, taxes will be applied on the invoice issued at the time of shipment.

For order tracking information, log into Windows into Waukesha® at www.spxwaukesha.com. To get started, select the "Windows into Waukesha" link at the top of the home page screen, then "Request Account" under the ENTER button for 24/7/365 access to key milestone dates on your orders.

ISO9001:2008 CERTIFIED

WAUKESHA®





WAUKESHA®

DANVILLE POWER & LIGHT

SPX Waukesha Quotation # 70004100

4/2/2014

City of Danville

IFB 13/14-0105 Bid Proposal – Revised for addendum 1

In compliance with Invitation to Bid No.13/14-105 and subject to all conditions thereof and attached hereto, the undersigned offers and agrees if this bid be accepted to furnish any and **all** of the items or services for the sum of:

COMMODITY AMOUNT

18/24/30MVA 69kV – 12.47/7.2kV GRDY Two Winding LTC Medium Power Transformer Spec. No. BH1819
NOTE: INFORMATION REQUESTED IN SEC 21 SHOULD BE COMPLETED

Offering: Make: 18/24/30 MVA Delivery ARO: 26-30 wks aro

A. Purchase Price = $ 525,785.00 EA

B. No load losses: 13.0 KW X $4,400.00/KW = $ $57,200.00 at 18 MVA

C. Load losses: 71.3 KW X $1,300.00/KW = $ $92,690.00 at 18 MVA

D. Auxiliary losses: 1.8 KW X $940.00/KW = $ $1,692.00 at 30 MVA

Total Owning Cost (A + B + C + D) = $ 677,367.00

The undersigned Bidder acknowledges receipt of the following addenda, which have been considered in the preparation of this Bid:

No. 1 Dated 3/27/14

No. _____ Dated _____

Company Name SPX Transformer Solutions Date 4/1/14

Address 400 South Prairie Ave.

Waukesha, WI 53186
Zip Code

Signature Cheryl Shanovich AFFIX COMPANY SEAL (if applicable)

Signature (Printed) Cheryl Shanovich

Title Sr. Application Engineer

Phone 262-513-0618 Fax 262-521-0198

Commonwealth of Virginia State Corporation Commission Identification Number F1281171

City of Danville
Virginia

J. Gary Via, CPPO
Director of Purchasing

PO Box 3300
Danville, VA 24543
Phone (434) 799-6528
Fax (434) 799-5102
e-mail: viajg@ci.danville.va.us

March 27, 2014
IFB 13-14-105
"Brantly Substation Transformer"
Addendum No. 1

Please note the following changes:

1. Section 5.5 should read : Impedance 8.5 % @ **18** MVA (HV-LV)

2. Corrected bid proposal sheets are attached revising the loss evaluations to:

   No-Load losses @ 20 deg C:

   At 18 MVA: 13.0 KW x $ **4,400.00** * /KW = $57,200.00

   Load losses @ 85 deg C:

   At 18 MVA: 71.3 KW x **$ 1,300.00** * /KW = $92,690.00

   Auxiliary losses:

   At 30 MVA:1.8 KW x **$940.00** * /KW = $1,692.00

3. Section 11.0 should be as follows:

   11.0 Current Transformers

   Multi-ratio bushing type current transformers for relaying service shall be furnished as described below:

   Each high voltage bushing:

   11.1.1 Qty 1, 600 /5 MR, with accuracy of C 800 .
   11.1.2 Qty 1, 600 /5 MR, with accuracy of C 800 .
   11.1.3 Qty 1, 600 /5 MR, with accuracy of C_____.

   Each low voltage bushing:

   11.2.1 Qty 1, 2000 /5 MR, with accuracy of C 800 .
   11.2.2 Qty 1, 2000 /5 MR, with accuracy of C 800 .

11.2.3 Qty 1 , 2000 /5 MR, with accuracy of C 800 .

11.3 Low voltage neutral bushing:

11.3.1 Qty 1 , 600 /5 MR, with accuracy of C 800 .

11.3.2 Qty 1 , 600 /5 MR, with accuracy of C 800 .

11.4 All Current Transformers shall have fully distributed windings and a minimum Thermal Rating Factor of 2.0

All other specifications remain the same.

J. Gary Via, Director of Purchasing

Company Name: SPX Transformer Solutions Signature: Cheryl Shanovich

Address: 401 South Prairie Ave. Signature: Cheryl Shanovich
(Printed)

Waukesha, WI 53186 Title: Sr. Application Engineer
City State Zip Code

Date: 4/1/14 e-mail address: cheryl.shanovich@spx.com

Phone No: 262-513-0618 Fax No: 262-521-0198

maintaining full load indefinitely

20.11 An automatic recharging dehydrating breather shall be located at operator level for ease of maintenance.

20.12 LTC performance shall be based on entire range of operations (+/-16) and maximum nameplate rating unless otherwise specified by the owner.

21.0 Please complete the following information to help us evaluate your proposal more thoroughly:

Main Coil Design: Round or Rectangular? Round

Type of windings:
HV: Disk or Helical: Disc

LV: Disk or Helical: Helical

Regulating Voltage Winding:
Tapped or Fully Distributed? Fully Distributed

Preventive Auto Transformer design:
Round or Rectangular? N/A

Winding Disc or Helical? N/A

Series Transformer coil design:
Round or Rectangular? Round

Winding Disc or Helical? Inner = Disc, Outer = Helix

Series Transformer coil design:
Round or Rectangular? -

Winding Disc or Helical? -

Type of LTC: UZD Resistive? Yes

Expected Number of Operations Before Contact Replacement: 500,000

Series Transformer Ratio: 5.6:1

Can the LTC be manually operated without de-energizing the transformer? Yes

LTC operation Constant Flux Voltage Variation Operation Warranty:
State the length of the warranty period: 5 Years

Is in/out coverage included & for how long? Yes, covered for 1 year

Does the warranty cover all accessories as well as the core & coil? Yes

Shipment:

Will transformer ship oil filled? No

F.O.B. destination: Yes/No FOB Pad

Proposed destination: Per spec, Danville, VA

Nearest Rail Siding/Site/Pad Pad

Short Circuit Design:

Does the winding design assume an infinite buss where the fault current is limited only by the impedance of the transformer? Yes

Does the short circuit design consider single phase line to ground fault conditions? Yes

22.0 DATA TO BE SUPPLIED WITH VENDOR PROPOSAL

22.1 Typical design (including outline) drawings of the units bid must be included with the bid proposal.

23.0 DATA TO BE SUPPLIED BY THE SUCCESSFUL BIDDER

23.1 Three (3) instruction booklets containing complete descriptive information and a parts list showing catalog numbers, quantities and diagrams to be included with each unit. Also three (3) sets of drawings for each unit to include, but not be limited to, the following:

23.2 Nameplate

23.3 Outline

23.4 Applicable detail drawings

24.0 DELIVERY

24.1 Date of shipment from the factory and the location of the factory to be supplied with the bid proposal on each unit quoted.

24.2 Transformers to be delivered to City of Danville Electric Division, 1040 Monument Street, Danville, Virginia 24541. All shipments to be marked "FLAT BED ONLY".

25.0 LOSS EVALUATION

25.1 Losses will be evaluated according to the formula shown below. Manufacturer shall provide the necessary information at the time of bid opening to perform the loss evaluation. This loss information should be based on 85 deg. C. at 100% voltage using "guaranteed loss" figures; i.e., the average of the losses of the units involved shall not exceed quoted values and the losses

of any individual unit shall not exceed the tolerances in Table 16, ANSI Standard C57.12.00.

25.2 In the event that the actual tested losses of the quoted transformer(s) exceed by 10% the guaranteed loss values quoted in the proposal, the purchase price of the unit(s) shall be reduced by the evaluated cost of the difference between actual and guaranteed losses.

18/24/30 KVA UNITS(S):

25.3 No-Load losses:

13.0 KW x $ 4,400.00 * /KW = $57,200.00

25.4 Copper losses:

71.3 KW x $ 1,300.00 * /KW = $92,690.00

25.5 Bid price (each unit) = $525,785.00

25.6 Total evaluated cost (i+ii+iii) = $675,675.00 *Note, this does not include the aux losses.

SPX Waukesha Quotation

4/2/2014

DANVILLE POWER & LIGHT
1040 MONUMENT STREET
DANVILLE, VA 24543

Inquiry	IFB 13/14-105 - Brantley Substation Transformer
Quote Number	70004100
Specification Document(s)	BRANTLEY SUB 18/24/30 MVA

CONTACT INFORMATION

Channel Partner
Jordan Tyler
Bradley Electro Sales Corp.
TEL 804-320-8005
FAX 804-320-8006
jtyler@bradleyelectro.com

Sr. Application Engineer
Cheryl Shanovich
SPX Transformer Solutions, Inc.
TEL 262-513-0618
FAX 262-521-0198
cheryl.shanovich@spx.com

Territory General Manager
Matthew Webb
SPX Transformer Solutions, Inc.
TEL 919-581-1643
FAX 919-580-3254
matt.webb@spx.com

QUOTE SUMMARY

Item Number	10
Price Per Unit	$525,785.00
Quantity	1
Rating Information	18/24/30 MVA, ONAN/ONAF/ONAF, 3 Phase, 60 Hz., 65 Degree C rise, 69.00 kV DELTA To 12.47 kV WYE with UZD LTC. NOTE: Impedance is 8.5% at 18 MVA.
Shipment Lead Time	**Current lead times are 26-30** weeks after receipt and acceptance of a written purchase order in our office, subject to plant loading at the time of receipt of order. If required, alternate shipment may be available. Please consult the Channel Partner, Application Engineer or Territory General Manager identified in the CONTACT INFORMATION shown in this quotation.
Payment Terms	Quoted Prices do not include sales, use, excise or any other taxes. Any taxes imposed shall be the responsibility of customer and will be invoiced accordingly. **Option 1:** Firm Pricing Payment terms, subject to credit approval, are: 30% to be invoiced with Order Acknowledgment (Due Net 30 days from date of invoice) 30% to be invoiced when released to Manufacturing (Due Net 30 days from date of invoice) 30% to be invoiced at time of shipment (Due Net 30 days from date of invoice) 10% to be invoiced upon shipment of the transformer (Due Net 30 days from date of delivery)

Option 2: Price Adjustment Policy
At the time of final invoicing, Waukesha will provide an updated selling price based upon the change in material costs for copper, core steel, plate steel, mineral oil, and paper insulation since the time of quotation. The final selling price will be (adjusted upwards or downwards) using the indices identified below and the latest available at time of shipment. Payment terms, subject to credit approval, are 100% Due Net 30 Days from date of invoice (Shipment.)

The following material indices are the base indices for this quotation:

Material	Name	Value	Unit	Index Date
Copper	HG-Comex	304.65	cents/lb	03/31/2014
Core Steel	WES	1.0	$/unit	03/31/2014
Plate Steel	AMM No. 1 Heavy Melt: Chicago	375.00	$/gross ton	03/31/2014
Oil	West Texas Crude Index	101.58	$/42-gal barrel	03/31/2014
Paper	PIX U.S. NBSK	1019.86	$/ton	03/31/2014

ADDERS

Short Circuit Testing	TBD
~~Design Review at SPX (travel expenses are not included)~~	~~$1,950.00 per design~~

DRAWINGS

Approval drawings will be provided within 10-12 weeks after issue date of SPX Waukesha Order Acknowledgment. Quoted Shipment Lead Time includes 1 week for customer to review and return approval drawings.

For orders requiring drawing approval, a release to immediately proceed with production must be returned to SPX Waukesha within 1 week after drawing submittal to maintain scheduled date.

OIL

Oil is included in the quoted transformer price. If oil is shipped separately, pricing includes shipment/delivery of the oil within sixty (60) days of shipment of the transformer. After that date, customer will be invoiced for any cost exceeding **$5.75**/gallon.

PRICE POLICY

The above quoted prices are for shipment shown, subject to the following conditions:

- Factory acceptance of a written purchase order or contract, within the validity period of this quotation.
- There will be a 1-½% charge per month of the unpaid balance beginning 15 days after the due date of invoice. The amount charged shall not be in excess of the applicable usurious rate.

SHIPMENT

The above quoted transformer will be shipped dry air filled by truck, F.O.B. to your specified pad, providing no unusual circumstances unknown to SPX Waukesha are present, such as no existing roads, impassable conditions, extreme grade or anything else which would prevent SPX Waukesha from delivering to the transformer site, and providing that free access is available to allow SPX Waukesha to unload the equipment on the pad, without obstructions such as existing fencing, overhead lines, insufficiently compacted soil (necessitating matting), oil containment pits or dikes around pad, debris, etc. Any additional costs resulting from the above stated possible conditions will be charged to the customer.

FIELD SERVICE

Field Service Installation, fill and testing is included in the quoted transformer price. If service has not been performed within ninety (90) days after shipment of the transformer, customer may be responsible for any increase in SPX Waukesha Service Field Service rates. Details of the services to be provided are included as an attachment to this quotation.

TERMS & CONDITIONS

The enclosed SPX Transformer Solution's **Transformer Terms and Conditions of Sale** are an integral part of this offer, and shall apply except as otherwise agreed to in writing by an authorized employee of SPX Waukesha. **Alternate Terms and Conditions are subject to negotiation.**

Seller shall in no event be liable for any indirect, special or consequential damages whatsoever, whether grounded in tort (including negligence), strict liability, or contract. Under no circumstances shall Seller's liability to Buyer exceed the contract price for the specific goods and services upon which the claim is based. Any action for breach of contract or otherwise must be commenced within one year after the cause of action has accrued.

SPX Transformer Solutions reserves the right to correct clerical and administrative errors in this quotation, and other related documents.

WARRANTY

The above transformer is quoted with the **SPX Transformer Solutions' Five Year Power Transformer Warranty** in lieu of all others specified, expressed or implied. To qualify for the SPX Waukesha Five Year Warranty, a SPX Waukesha Service representative ***must be*** present at the time the transformer is dressed out, and both the primary and secondary must be protected from surges with arresters mounted on the transformer tank.

In addition to the above, full compliance to the SPX Waukesha Instruction Manual is required to validate the warranty. A complete Instruction Manual is provided in the control box of every SPX Waukesha Power Transformer.

COMMERCIAL NOTES & COMMENTS

1. The SPX Transformer Solutions Warranty requires that suitable Lightning Arresters be mounted on the transformer tank and connected to all windings (phase connections) whenever the transformer is energized. Failure to provide these Lightning Arresters will nullify the Five Year Warranty.

2. Customer requested Adders shall be added to the transformer price and they shall be payable in accordance with agreed upon payment terms unless otherwise stated by SPX Transformer Solutions in writing.

COMMERCIAL EXCEPTIONS

Exceptions to IFB 13/14-105 – 3.0 Supplemental General Conditions:

3.7 Patents; - Insert the following after "equitable" in the 4th line:

provided that Vendor's obligations hereunder shall not apply to any suit or action that results from Vendor's compliance with City's specifications, design or instructions, or from City's combination of Vendor's work with other goods or services.

3.9 Performance – The following modifications shall apply to this section:

- Insert the following between "Vendor" and "the City" in the 1st line:

  ...City shall give Vendor written notice of default and shall give Vendor a reasonable opportunity to initiate a cure to such default. If Vendor does not initiate and diligently pursue such cure, then....

- Insert the following at the end of this clause:

  Any delay, suspension or termination of an order for the City's convenience will be subject to Vendor's Cancellation and Delay Policy, as attached to Vendor's quote.

3.14 Indemnification – The following modifications shall apply to this section:

- Insert "third party" between "any" and "claims" in the 4th line.
- Delete "including workers' compensation claims" from the 4th and 5th lines.
- Insert "negligent" before "operations" at the beginning of the 6th line.
- Insert "negligent" between "including" and "operations" in the 6th line.
- Insert "negligent" between "and' and "acts" in the 7th line.

3.14 c. - The following modifications shall apply to this section:

- Insert "acts of the City" after "Public Enemy" in the 3rd line.
- Modify the 4th line to read as: ...Government, quarantine restrictions, ~~general~~ strikes **and labor disputes** ~~through the trade~~ or...
- Insert the following after "the Vendor" in the 5th line:

  In the event of any such delay, the date of performance shall be extended for a period equal to the time lost by reason of delay, plus a reasonable time for resuming performance.

3.14 d. - The following modifications shall apply to this section:

- Insert "third" between "or" and "party" in the 2nd line.
- Insert "third party" between "to" and "property" in the 4th line.
- Delete "either" from the 4th line.
- Insert "negligent" between "the" and "performance" in the 4th line.
- Delete from "or that may be" in the 5th line to the end of this section.

3.14 e. – Delete "solely" from the 3rd line.

Insert the following new sections:

3.17 Warranty

Vendor's Five Year Power Transformer Warranty shall apply in lieu of all other warranties, express or implied.

3.18 Changes

Any change or modification to these terms or any order under these terms shall require a change order, to be signed by Vendor and City, prior to the implementation of any proposed change.

3.19 Title and Risk of Loss.

Title and risk of loss shall transfer to City when equipment is delivered to the shipping destination. City shall advise Vendor and carrier of any observable damage or irregularity pursuant to Vendor's Receiving Instructions. Defects and non-conformances reported after acceptance of delivery shall be corrected in accordance with Vendor's warranty.

3.20 Limitation of Liability.

Vendor shall in no event be liable for any indirect, special or consequential damages whatsoever, under any theory of relief, including without limitation, breach of warranty, breach of contract, tort (including negligence), strict liability, or otherwise, arising out of or related to Vendor's acts or omissions. Under no circumstances shall Vendor's liability to City exceed the contract price for the specific goods and services upon which the claim is based. Any action for breach of contract or otherwise must be commenced within one year after the cause of action has accrued.

TECHNICAL NOTES & COMMENTS

1. **Regarding this quoted Replacement Transformer:** SPX Waukesha has to incorporate the site requirements with the information provided to offer a design that will meet Form, Function and Fit criteria. However, it may not be possible to manufacture a transformer today that can exactly replace the previous transformer. Replacement of the previous transformer with a new unit may call for modifications of connections, structures and other systems, and the cost for such work is not included in the price quoted. The proposed transformer base and radiators may overhang beyond the existing foundation and it shall be the customer's responsibility to verify the load bearing capability of the foundation for the transformer quoted.

2. SPX Waukesha provides unpainted galvanized radiators for all its transformers. Compared to conventional painted radiators, galvanized units provide superior protection against rust and corrosion, reducing transformer maintenance time while extending radiator life.

3. Non-conformances and defects will be addressed per the provisions of the applicable SPX Waukesha warranty.

4. The quoted price includes the standard SPX Waukesha paint finish system. The paint finish on tank will comply with C57.12.28 paint requirements while the cooling radiators will be unpainted and constructed of hot-dipped, galvanized steel. Reference attachment *Transformer Paint Systems* for additional clarification.

5. SPX Transformer Solutions uses inhibited mineral oil meeting ANSI / ASTM D-3487 in its transformers. Oil is purchased only from approved sources and for each approved source, oil has been tested and proven to meet the ANSI / ASTM D-3487 values. Ergon Refining Hyvolt-II **inhibited** Type-II mineral oil with less than 2 PPM PCB content. Specification and MSDS are attached to proposal. Oil meeting other specific customer requirements may be available upon request.

6. For system voltages less than or equal to 69 kV, guaranteed bushing C2 P.F. levels are less than or equal to 1.26%.

LOSS GUARANTEE

In accordance with ANSI Standard C57.12.00-2006 Section 5.9, No-load (core) loss guarantee on the enclosed performance specification(s) is based on the standard reference temperature of 20°C. Load (winding) loss guarantee is at the standard reference temperature of 85°C on 65°C rise rated transformers (or 75°C on 55/65°C rise rated transformers).

SPX Waukesha tests no-load and load losses with less than 1.0% measurement error. These measurement errors are determined by a calibration system that is traceable to the National Institute of Standards and Technology (formerly the National Bureau of Standards) using methods described in NIST's Technical Note 1204.

☑ AWARD OF CONTRACT

In the event that the transformer contract is awarded to SPX Transformer Solutions, please provide the following text on the purchase order to help expedite order processing: **Unit(s) will be Designed, Manufactured, Tested, Shipped, Sold and Invoiced in accordance with SPX Transformer Solutions' Quotation 70004100, dated 4/2/2014.**

BID VALIDITY

Due to the rapid change in the cost of commodities required to manufacture power transformers, this proposal will remain in effect for 60 days, unless changed in the interim by written notice. Extensions to the 60-day validity will be considered, as required, to facilitate the order process.

Sincerely,
SPX Transformer Solutions, Inc.

Cheryl Shanovich

Cheryl Shanovich
Sr. Application Engineer

ENCLOSURES

SPX
TRANSFORMER SOLUTIONS

Performance Specification

FOR: 1105 DANVILLE POWER & LIGHT

Quotation No: 70004100 **Item No:** 000010 **Project Name:** 18/24/30 MVA Transformer

TRANSFORMER RATINGS

Phase	3	Cooling	HV Volts		XV Volts		YV Volts		ZV (TV) Volts	
Frequency	60	Class	69,000	--	12,470	--	--	--	--	--
Temp Rise °C	65		Delta	--	Wye	--	--	--	--	--
Insulating	Oil	ONAN	18.00	--	18.00	--	--	--	--	--
		ONAF	24.00	--	24.00	--	--	--	--	--
		ONAF	30.00	--	30.00	--	--	--	--	--

ADDITIONAL TAP VOLTAGES

Terminal	Style	Taps or KV	Capacity
HV	DETC	+ 2 / - 2 @ 2.500 %	FULL
XV	UZD	+ 16 / - 16 @ 0.625 %	REDUCED

PERCENT IMPEDANCE VOLTS

%	Windings	At MVA
8.50	H-X	18.0
--	H-Y	--
--	X-Y	--

AUXILIARY LOSSES AND SOUND LEVEL

MVA	Class	Cooling	Sound Level dB
18.00	ONAN	--	71
24.00	ONAF	900	73
30.00	ONAF	1,800	74

The above values for cooling loss do not include ancillary equipment (heaters, control devices, etc.) losses of 2,000 watts

INSULATION LEVELS (KV)

Terminal	Winding		Bushing
HV Line	350	--	350
HV Neutral	--		--
XV Line	110	--	110
XV Neutral	110		110
YV Line	--	--	--
YV Neutral	--		--
ZV (TV) Line	--	--	--
ZV (TV) Neutral	--		--

PERFORMANCE BASED ON A LOADING OF

HV Winding	69,000	Volts @	18.00	MVA
XV Winding	12,470	Volts @	18.00	MVA
YV Winding	--	Volts @	--	MVA
ZV (TV) Winding	--	Volts @	--	MVA

EFFICIENCIES Base MVA (ONAN) = 100%

Load	100%	75%	50%	25%
Percent	99.53	99.61	99.66	99.61

REGULATION

Power Factor	Percent Regulation
1.0	0.75
0.9	4.33
0.8	5.61

PERFORMANCE_DATA No Load Temp: 20 °C/ Load Loss Temp: 85 °C

Exciting Current (Percent) and Loss (Watts)

Excitation	Exciting Current(%)	No Load Loss	Load Loss	Total Loss
100%	.500	13,000	71,300	84,300

MECHANICAL DATA - Not for Construction

Dimensions are in inches & weights are in pounds (approx.values)

Outline Drawing Number:

Shipping: Dry by Truck

	Base	Assembled	Shipping
Height (A)	--	174	144
Width (B)	170	191	191
Depth (C)	78	186	108
Height Over Cover (D)	--	144	144

	Weight (lbs)
Core and Coils	54,825
Tank and Fittings	32,313
Liquid (5,550 gallons)	41,625
Total Weight	128,763
Shipping Weight, Heaviest Piece	77,886

WAUKESHA®

SPX | WAUKESHA

Effective December 2011

Transformer Terms & Conditions of Sale

1. **ACCEPTANCE, GOVERNING PROVISIONS, AND CANCELLATIONS**. No orders shall be binding upon Seller until accepted in writing by Seller at its headquarters office or at its plant handling and processing such orders. Seller's acceptance of Buyer's order is conditioned upon Buyer's assent that the terms and conditions set forth herein shall be deemed as part of such order. No modified or other conditions will be recognized by Seller unless specifically agreed to in writing, and failure of Seller to object to provisions contained in any purchase order or other communication from Buyer shall not be construed as a waiver of these conditions nor an acceptance of any such provisions. No order accepted by Seller may be altered or modified by Buyer unless agreed to in writing by Seller, and no such order may be canceled or terminated by Buyer except with the written consent of Seller and upon payment of Seller's loss, damage and expense arising from such cancellation or termination as defined in Seller's Cancellation and/or Delay Policy. Any agreement of purchase or sale shall be construed in accordance with the laws of Wisconsin, without reference to principles of conflicts of law.

2. **PRICE POLICY**. Prices shall be as stated in Seller's quotation, prices shall be valid for the duration of the quotation and only for shipment within the quoted leadtime.

3. **TERMS OF PAYMENT**. Terms of payment are specified in Seller's quotation, and payments are due net thirty (30) days from date of invoice. Seller shall charge 1-1/2% per month of the unpaid invoice amount beginning thirty-one (31) days after date of invoice, but the amount shall not exceed any rate prohibited by applicable law. In the event there are any negotiated changes made to the order that result in a negotiated change in price that is (a) greater than or equal to ten percent (10%) of the price of the affected unit, excluding applicable taxes, freight, rigging or other ancillary charges, or (b) greater than or equal to one-hundred thousand dollars ($100,000.00), then Customer shall be invoiced for the lesser of such amount at the time of the agreed-upon change, and payment shall be due upon receipt of said invoice. Any other negotiated changes made to the order that result in a negotiated change in price shall be debited or credited on the final invoice. Buyer shall provide Seller with any Buyer-specific invoice requests at the time the order is placed.

4. **TAXES**. Price does not include sales, use, excise or other taxes, for which Buyer assumes liability wherever applicable to the order, unless otherwise agreed in writing. Buyer shall provide any tax exemption certificate(s) or direct pay permit(s) at the time the order is placed.

5. **FREIGHT**. Except as otherwise stated in Seller's quotation, prices for freight shall be F.O.B. jobsite or nearest railsiding, freight prepaid and allowed, to the jobsite or nearest railsiding. Buyer shall be responsible for providing a readily accessible shipping destination without obstructions at or to the jobsite. Title and risk of loss shall transfer to Buyer when equipment is delivered to the shipping destination. Buyer shall advise Seller and carrier of any observable damage or irregularity pursuant to Seller's Receiving Instructions. Defects and non-conformances reported after delivery shall be corrected in accordance with Seller's warranty. Any detention charges by the carrier are Buyer's responsibility.

6. **DELIVERY**. Seller shall not be liable for any loss or damage as a result of any delay in shipment, delivery or installation due to any cause, whether at Seller's operations or at the operations of a supplier or subcontractor to Seller, beyond Seller's reasonable control, including, without limitation: flood, hurricane, or other act of God; act of Buyer; embargo or other governmental act, regulation, order or request; fire; theft; accident; strike, slowdown, or labor dispute; war; riot; delay in transportation; inability to obtain necessary labor, materials or manufacturing facilities. In the event of any such delay, the date of performance shall be extended for a period equal to the time lost by reason of delay, plus a reasonable time for resuming performance. If shipping or progress of work is delayed or interrupted for any cause for which Buyer is directly, or indirectly responsible and additional costs (including storage costs) are incurred by Seller due to such delays, Buyer shall reimburse Seller for such added costs.

7. **INSTALLATION**. All equipment shall be installed by and at the expense of Buyer unless otherwise agreed in writing. Assistance in initial operation of certain equipment and instruction of operators may be given as normally required. Additional assistance requested by Buyer shall be chargeable at standard rates plus living and travel expenses, unless otherwise agreed in writing.

8. **WARRANTIES**. Seller warrents the equipment to be free from defects in material and workmanship for a period of one (1) year after delivery by Seller. If within such period any such equipment or parts shall be proved to Seller's satisfaction to be defective, such equipment or parts shall be repaired or replaced at Seller's option, with all removal and installation to be at Buyer's expense. Seller's obligation hereunder shall be limited to such repair or replacement, F.O.B. its factory, and shall be conditioned upon Seller's receiving written notice of any alleged defect within ten (10) days after its discovery and at Seller's option, return of such equipment or parts prepaid to its factory.

   This warranty shall not apply to equipment or parts that have been subjected to negligence, accident, damage by circumstances beyond Seller's reasonable control, or improper operation, maintenance or storage, or modification by Buyer.

   For this warranty to be valid, Seller requires that all windings be protected from surges with arresters mounted on the transformer tank. Any other location must be approved by Seller.

   Under no circumstances will Seller be responsible for damage in excess of the sale price to Buyer for the goods and/or services for which damages are claimed.

   THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER EXPRESS OR IMPLIED WARRANTIES (EXCEPT TITLE) INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PURPOSE, AND STATE SELLER'S ENTIRE AND EXCLUSIVE LIABILITY AND BUYER'S EXCLUSIVE REMEDY.

   SELLER SHALL NOT BE LIABLE FOR ANY INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL, DAMAGES WHATSOEVER.

9. **LIMITATION OF LIABILITY**. Except as specifically provided in Article 10, Seller shall in no event be liable to Buyer or Buyer's customer for any indirect, incidental, special or consequential damages whatsoever, under any theory of relief, including, without limitation, breach of warranty, breach of contract, tort (including negligence), and strict liability, arising out of or related to Seller's acts or omissions. Under no circumstances shall Seller's liability to Buyer exceed the contract price for the specific goods and services upon which such liability is based. Any action for breach of contract or otherwise must be commenced within one (1) year after the cause of action has accrued.

10. **PATENTS AND COPYRIGHTS**. If Buyer receives a claim that any equipment or part thereof (herein called "Product") manufactured by Seller infringes a U.S. Patent or Copyright, Buyer shall promptly notify Seller in writing and give Seller information, assistance and exclusive authority to evaluate, defend, and settle such claim. Seller shall then at its own expense and option (a) settle such claim; (b) procure for Buyer the right to use such Product; (c) replace or modify it to avoid infringement; (d) remove it and refund the purchase price less accrued depreciation; or (e) defend against such claim. Provided such timely notice, information, assistance and authority have been given by Buyer to Seller, should any court of competent jurisdiction hold such Product to constitute infringement, Seller shall pay any costs and damages finally awarded on account of such infringement and, if the use of such Product is enjoined, Seller shall take at its option one or more of the actions under (b), (c) or (d) above. With respect to any product not manufactured by Seller, the patent indemnity, if any, given by the manufacturer thereof shall apply in place of the foregoing indemnity.

    The foregoing indemnity shall not apply to (i) any claim that arises out of Seller's compliance with the specification, design or instructions of Buyer or (ii) any claim of infringement resulting from Buyer's use of Product in combination with other equipment and materials not furnished by Seller. Buyer shall hold Seller harmless and indemnified against all such claims. The rights and obligations of the parties with respect to Patents and Copyrights are solely and exclusively as stated herein.

11. **SUBSTITUTES, CHANGES AND IMPROVEMENTS**. Factors beyond Seller's control and the need for continuing improvement of its goods may require changes in its goods from time to time. Seller reserves the right to make reasonable changes of goods of any kind without notice, and to deliver revised designs or models of goods against any order, unless the right is specifically waived in writing. Seller shall have no responsibility whatever with respect to changes made by the manufacturer of goods sold but not manufactured by Seller. Buyer's requested order changes are subject to Seller's prior written approval and to adjustments in price, scheduling and other affected terms and conditions, which shall be documented in a writing signed by both parties before such change order shall be implemented by Seller.

12. **RETURNS**. Goods may not be returned for credit until and unless Seller has given consent in writing to accept them. Materials not normally stocked by Seller will not be accepted for credit allowance except at Seller's option. Materials returned without Seller's approval will be credited at Seller's evaluation. A minimum 15% restocking charge, plus freight charge, will be imposed on the return of stock items when such returns are authorized by Seller.

13. **CANCELLATION AND DELAY**. Any delay, suspension or cancellation of an order by Buyer shall be subject to Seller's Cancellation and Delay Policy.

SPX | WAUKESHA

Effective December 2011

Five Year Power Transformer Warranty

SPX Transformer Solutions, Inc., hereafter referred to as SPX Waukesha, warrants to the original purchaser that the complete transformer, together with all parts included in the original purchase (the "Transformer"), has been designed in accordance with the specifications of the original purchaser and that the Transformer will be free from defects in material and workmanship under normal use and service for a period of five (5) years from the date of arrival of the Transformer at its destination from the factory. SPX Waukesha's liability under this warranty does not extend to defects caused by vandalism, improper installation, improper maintenance, alterations by purchaser, purchaser-furnished materials, or improper operation. For this warranty to be valid, SPX Waukesha requires that all windings be protected from surges with arresters mounted on the transformer tank. Any other location must be approved by SPX Waukesha.

A Customer Service Representative must be present during field assembly, vacuum filling (if required) and inspection of the installation prior to energization. In the event that the Transformer is relocated, a Customer Service Representative must be present during field re-assembly, vacuum-filling (if required) and inspection of the re-installation prior to re-energization.

Purchaser forfeits the provisions of the Five Year Warranty if either of these service requirements is not followed.

If any part is found to contain defects in material and/or workmanship during the five year warranty period, SPX Waukesha's liability and Purchaser's remedies under this warranty shall be limited solely to repair or replacement, at SPX Waukesha's option, of the defective part. Decision on the method and extent of repairs rests solely with SPX Waukesha. Purchaser shall give SPX Waukesha prompt written notice of any claim hereunder. SPX Waukesha shall be given a reasonable opportunity to investigate all claims, and no parts may be returned to SPX Waukesha without authorization and instructions from the Customer Service Department.

During the first year, this warranty covers any freight within the 48 contiguous states by common carrier in full. This warranty also covers the cost of removal from the site and reinstallation after repair, subject to a limit of 10% of the original selling price. Costs of moving structures or associated equipment are excluded. During the last four years, transportation, moving and reinstallation costs are excluded from this warranty.

Under no circumstances will SPX Waukesha be responsible for damage in excess of the sale price to Purchaser for the goods and/or services for which damages are claimed.

THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SPX WAUKESHA SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES OR EXPENSES OF ANY KIND, INCLUDING LOSS OF PROFITS.

In the event a performance bond is provided as part of the contract to which this warranty applies, the Surety's liability shall be limited to one (1) year from the date of delivery of the Transformer. The remaining four (4) year warranty period is solely the obligation of SPX Waukesha.

Assembly, Vacuum Filling & Testing: Units Shipped Without Oil

applicable for transformers < 60 MVA based rating and < 230kV

If included in the quoted price or selected as an "adder" as outlined in the proposal, Waukesha® Service crews and equipment will perform the transformer installation once the transformer has been placed on the pad. Assembly and testing work will include the following:

ASSEMBLY

- Install, connect and tape, as necessary, all bushings
- Hang and brace radiators and/or fans
- Mount oil preservation system, if required
- Mount lightning arresters, if required
- Mount control cabinet, if required
- Mount any miscellaneous items removed for shipment
- Check all internal clearances including DETC and LTC (if equipped) for proper alignment and timing
- Hang any conduit removed for shipment; pull and terminate associated wiring

OIL FILLING

- Elevate core/coil temperature, if necessary
- Conduct vacuum leak test
- Vacuum fill in accordance with SPX Transformer Solutions' Instruction Leaflet Document No. 2011
- Pull vacuum at a level of 1 Torr (1,000 micron,1mm of Hg) or less and hold for a minimum of 8 hours
- Vacuum fill transformer oil while maintaining a vacuum level of 5 Torr or less
- Pull tail vacuum for 1 hour after completing filling
- Fill conservator tank or activate nitrogen system, as appropriate for transformer design

TESTING

As specified in SPX Transformer Solutions' Pre-operational Testing Instruction Booklet No. 2012, the minimum acceptance tests include the following:

- Bushing power factor and capacitance
- Core megger
- Transformer turns ratio
- Insulation power factor
- Insulation resistance
- Functional check of unit control cabinet
- Oil test after filling
  1. Moisture content
  2. Power factor
  3. Dielectric strength
  4. Flash and fire point (FR3™ units only)

See next page for Scope Clarifications.

SCOPE CLARIFICATIONS

For all transformer installations, the following apply:

- Purchaser shall be responsible for switching, lock out and grounding of any equipment necessary to establish safe work area.
- Purchaser shall provide suitable, free, clear, unlimited and compacted access route, roads and area around work location for access of service equipment.
- Purchaser shall connect all external protection, control and relay wiring, as required.
- Purchaser shall connect all external bushing terminations or bus work, as required.
- Purchaser shall assemble any deluge systems, as required.
- SPX Waukesha will compile all crating and waste material in designated area; however, purchaser shall be responsible for disposal of solid wastes.
- Purchaser shall provide drum and dispose of all waste, flush and scrap oil generated in execution of work.
- Purchaser shall provide communication and sanitation facilities.
- No provisions have been included for secondary oil containment as may be required for compliance to local site SPCC programs.
- No provisions have been included for Union Labor requirements.
- Any site specific or customer required access and/or safety training is not included in pricing and would be billed at applicable field service rates.
- If Envirotemp™ FR3™ is included in this quotation, acceptance test results of FR3™ fluid will differ from the typical values of transformers filled with mineral oil. Insulation power factor values are expected to increase and insulation resistance values are expected to decrease when compared to test values with mineral oil insulation system.
- If Envirotemp™ FR3™ is included in this quotation, Purchaser shall be responsible for disposal of all totes/drums utilized for make-up and flush oil that is generated during course of project. SPX Waukesha can arrange for disposal upon request at additional cost.

Should additional requirements, tests and/or processing procedures apply, please contact SPX Transformer Solutions' Service group for pricing at 800.758.4384.

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Escalation Example

CUSTOMER NAME: Enter Customer Name	INITIAL SELLING PRICE: $600,000
CUSTOMER P.O.#: Enter Customer P.O. #	FINAL SELLING PRICE: $587,234
[LOCATION] UNIT #: Enter Unit #	% PRICE ADJUSTMENT: -2.13%

		QUOTED BASELINE *(FROM QUOTATION)*	DATE OF INVOICE *(SHIPMENT)*		
MATERIAL	**INDEX USED**	17-Apr-12	23-Oct-12	**ADJUSTMENT MULTIPLIER**	**% OF SALES PRICE**
COPPER	HG-Comex	364.40	357.60	0.9813	9%
CORE STEEL	SPX Transformer Solutions	1.00	1.00	1.0000	9%
PLATE STEEL PRODUCTS	AMM No. 1 Heavy Melt: Chicago	405.00	310.00	0.7654	6%
OIL *(if furnished)*	West Texas Crude Index	104.20	86.67	0.8318	2%
PAPER INSULATION	PIX U.S. NBSK Index	895.12	846.83	0.9461	4%

Cancellation / Delay Policy

1. Cancellation of an order will be accepted after the purchaser has given written notice. If the cancellation occurs during the period from the date of order entry to twelve (12) weeks after order acknowledgement, the cancellation charges will be the actual work hours expended on the job performed at a rate of $250 per hour or a minimum of five percent (5%) of the purchase price, whichever is greater.

2. If the cancellation occurs after approval drawings have been issued by SPX Waukesha, the termination charge will be thirty percent (30%) of the purchase price.

3. Notwithstanding items 1 and 2 above, if the order is cancelled twenty six (26) weeks or less prior to shipment, the cancellation charge shall be one hundred percent (100%) of the purchase price.

4. If the order is suspended or shipment is delayed twenty six (26) weeks or less prior to the scheduled ship date, the equipment will be completed, invoiced, and stored at the customer's expense in accordance with the terms of SPX Waukesha's Storage Policy and Customer shall issue the required storage documentation.

5. If a request to delay shipment changes the scheduled ship date, a mutually agreed upon adjustment to the base price may be necessary.

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Transformer Storage Policy

Purchaser - Company Name

SPX Waukesha Order / Transformer Unit No.

SPX Transformer Solutions, Inc. has limited facilities for storing new transformers and any related equipment (collectively the "Transformer") in the event that the customer cannot accept delivery upon completion of manufacture. The facilities are intended only for short-term outdoor storage. Therefore, increased rates apply for storage exceeding three months.

1) In order to comply with SPX Corporation's company-wide accounting policy for bill-and-hold transactions, **SPX Transformer Solutions must receive from the customer a signed Request for Storage, per the attached form, submitted on the customer's letterhead, prior to placing any equipment into storage.** Notification to SPX Transformer Solutions is defined as receipt of the signed Request for Storage at our offices.

2) The Request for Storage must state that title and risk of ownership of the Transformer transfer to the customer at the time the Transformer is placed into storage. The warranty period for any Transformer placed in storage starts upon arrival at the destination or six months after completion of manufacture, whichever occurs first.

3) Storage by SPX Transformer Solutions is contingent upon the availability of storage space at the facility. SPX Transformer Solutions may require the customer to accept shipment from storage after 3 months in storage, upon 30 days prior notice.

4) The charge to move the Transformer into and out of storage is **$4,000 in / $4,000 out**.

5) Storage periods greater than 30 days will result in monthly storage fees. One-half percent of the Transformer price shall be charged for each month, or portion of a month, of storage. The minimum charge for storage shall be **$1,500 per month**. After three months in storage, the monthly rate increases to one percent of the Transformer price (**$3,000 per month minimum**). The Request for Storage also grants SPX Transformer Solutions a security interest in the Transformer to secure payment of the purchase price and storage fees.

6) The Transformer will be invoiced to the customer when the Transformer is placed into storage. Storage fees will also be invoiced to the customer on a monthly basis.

7) Terms of payment are Net 30 Days from date of invoice.

8) For storage periods greater than 90 days, the delivery charges are subject to review at the time of shipment from storage. If there are any increases in freight or rigging rates or oil-filling costs from the time the equipment is invoiced to the time it is actually shipped out of storage, customer will be invoiced and required to pay the additional costs.

9) SPX Transformer Solutions requests four weeks advance notification for shipping out of storage to ensure that shipping preparations are completed in time to meet the designated ship date. If the anticipated date for removing a Transformer from storage changes, the customer shall request in writing that SPX Transformer Solutions grant an extension to the new anticipated removal date and provide the reasons for requesting an extension.

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Request for Storage

(this request must be submitted on purchaser's letterhead)

_____
Purchaser - Company Name

_____
Purchaser Address

_____
Purchaser Address

Date: _____

CHECK APPLICABLE MANUFACTURING/STORAGE LOCATION:

☐ **SPX Transformer Solutions, Inc.**
400 S. Prairie Ave.
Waukesha, WI 53186

☐ **SPX Transformer Solutions, Inc.**
2701 US Highway 117 South
Goldsboro, NC 27530

ATTN: _____
Sales Operations

REF: **Purchase Order No.** _____

SPX Waukesha Order / Transformer Unit No. _____

[Insert Customer name], located in **[insert customer location]** is not ready to use power transformer purchased on the above referenced purchase order and, therefore, requests that SPX Transformer Solutions, Inc. store the transformer at its location.

Please bill and store the transformer for us as of **[insert date, 20__]**. We accept title and risks of ownership of the listed transformer as of the related invoice date and normal payment terms begin on that date. We expect shipment will be required by **[insert anticipated shipment date]**.

We have received the SPX Transformer Solutions Storage Policy and agree to the terms of the policy. Please invoice us for the applicable storage fees on a monthly basis.

Sincerely yours,

_____
Signature

_____
Type or Print Name

_____
Title

Transformer Oil Specification

(as received from refiner)

SPX Waukesha's standard is **inhibited mineral oil with 0.3% DBPC (oxidation inhibitor)**. Oil meeting other specific customer requirements may be available upon request.

Oil is purchased only from approved domestic sources, and for each approved source, oil has been tested and proven to meet the following specification values:

KEY PROPERTIES	ASTM TEST METHOD	ANSI / ASTM D-3487 LIMITS
Physical Properties		
Color	D1500	0.5 max
Flash point, °C	D92	145 min
Interfacial tension @ 25°C (dynes/centimeter)	D971	40 min
Pour point, °C	D97	–40 max
Specific gravity @ 15°C/15°C	D1298	0.91 max
Viscosity, SSU/cSt @	D88 / D445	
100°C		36 / 3.0 max
40°C		66 / 12.0 max
0°C		350 / 76.0 max
Polychlorinated Biphenyls (PCBs) ppm	D-4059	Not Detectable
Visual appearance	D1524	Clear and Bright
Chemical Properties		
Aniline point, °C	D611	63–84
Approved antioxidant content, wt %	D2668, D1473	0.30 max
Corrosive sulfur [1] Test to be run for 48 hours @ 150°C	D1275B [1]	Non-Corrosive
Moisture, ppm	D1315, D1533	35 max*
Neutralization number, mg KOH/g of oil	D974	0.03 max
Oxidation stability Method A (acid / sludge test)	D2440	
72 hours		
sludge, wt %		0.10 max
Neutralization value, mg KOH/g		0.30 max
164 hours		
sludge, wt %		0.20 max
Neutralization value, mg KOH/g		0.40 max

*35 ppm max as received from refiner; SPX Waukesha dehumidifies to lower value for installation in transformer.

Continued on next page.

KEY PROPERTIES	ASTM TEST METHOD	ANSI/ASTM D-3487 LIMITS
Electrical Properties		
Dielectric breakdown voltage at 60 hertz		
Disc electrodes, kV	D877	30 min
VDE electrodes, kV		
@ 0.040-in. gap or	D1816*	28 min
@ 0.080-in. gap	D1816*	56 min
Dielectric breakdown voltage 25°C impulse conditions, kV		
Needle (negative)-to-sphere (grounded)	D3300	
@ 1-in gap		145 min
Power factor at 60 hertz, % at:		
25°C	D924	0.05 max
100°C	D924	0.30 max
Gassing Tendency @ 80°C (µL/min)	D-2300 B	+ 30 max

*D1816 only applies to new oil that has been filtered, dehumidified and degassified.

Oil shall be PCB-free to existing current law. Properties as listed are only attainable on new oil as received from the refinery. It is expected that oil contained in equipment as received from the manufacturer when properly sampled from such equipment usually exhibits characteristics slightly different from those obtained from new oil, which has not been in contact with apparatus constructional materials. In such cases, the oil should be evaluated per IEEE C57.106 (most recent release) for acceptance and maintenance of insulating oil in equipment.

IN-PLANT QUALITY CONTROL

In addition to extensive testing by an independent testing laboratory to determine approved sources of supply, SPX Waukesha performs acceptance tests on each shipment of oil received.

SPX Waukesha receives oil at its plants in dedicated tank cars and trucks. Upon arrival, acceptance testing is performed before the oil is unloaded into a SPX Waukesha storage tank. Prior to filling a transformer, oil is degassified and dehumidified, passed through Fullers earth and refiltered at various points in the process.

Transformer Paint Systems

SPX Transformer Solutions, Inc. (SPX Waukesha) provides as standard a coating system that exceeds the requirements of ANSI C57 12.28, "Enclosure Integrity—Above-Ground Pad-Mounted Enclosures" Specification (the specification for pad mounted equipment). The coating system consists of an epoxy primer with a polyurethane topcoat. This process has been both lab tested and field evaluated.

The coating system processes used for the transformer are as follows:

SUBSTRATE
Hot rolled low alloy steel.

SURFACE PREPARATION
The performance of a coating system is highly dependent upon the condition of the surface to which the coating is applied. All sharp edges, scale, weld spatter and surface irregularities shall be removed by shot blasting, hand grinding, sanding or other appropriate manufacturing procedures.

Shot blasted per SSPC-SP6 (Commercial Blast Cleaning) then detergent washed with an iron phosphate conversion coating and a non-chrome seal.

-or-

Blast to SSPC-SP10 (near white) condition and apply paint within 24 hours.

COATING PROCEDURE
Interior of tank and tank cover are coated using a white, two-part, oil-resistant epoxy enamel. The exterior surfaces are first painted using a two-part epoxy primer then top coated using a two-part urethane enamel. All coating materials are applied using plural component equipment that automatically measures and mixes the paint systems to eliminate operator error. The coatings are then force cured to produce a uniform cured coating.

COATING RESULT
Interior coating compatible with transformer oil per ASTM 3455; 3 mil exterior coating capable of meeting ANSI C57.12.28

The two-component coatings used for painted surfaces have a high crosslink density and an exceptional barrier property characteristic. Two-component systems develop full corrosion resistance at a 2 mil total film thickness (primer and topcoat); in fact, the mechanical properties of any organic coating will deteriorate as the thickness approaches 5 mils. For these reasons, the SPX Waukesha paint system exhibits optimal performance at a nominal 3 mil thickness (range 3–5 mils).

NOTE: Radiators are purchased from an outside supplier and are hot dip galvanized or painted to meet the customer's specification.

See next page for paint system test results.

October 8, 2012

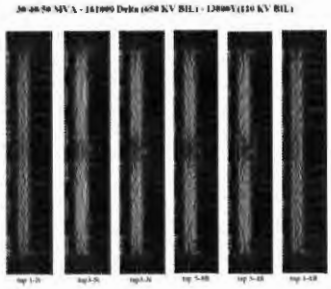
EXTERIOR PAINT SYSTEM PERFORMANCE

TEST	ASTM TEST METHOD	RESULTS
Adhesion	D-3359-B	No Removal
Salt Spray	B-117	1500 Hrs, 1/32" Loss of Adhesion
Humidity	D2247	1000 Hrs @ 40°C; No Blisters
Impact	D-2794	160 in/lbs., No Chipping
U-V Resistance	G-53	500 Hrs, Less than 15% Gloss Change
Taber Abrasion	D-4060	More than 3,000 Cycles @ 3 Mils
Oil Resistance	72 Hrs @ 100°C	No Effect
Thermal Aging	1,000 Hrs @ 120°C	No Effect
Pencil Hardness	D-3363	2-H After 2 Weeks
VOCs	D-2369	3.5 #/gal.

Short Circuit Testing

DESIGN

All SPX Waukesha transformers are designed with state-of-the-art tools and manufactured in our factories per strict quality assurance plans to ensure survival through even the worst-case faults. To start, worst-case fault currents are determined assuming infinite bus supply (zero system impedance) for single line to ground as well as three phase faults at the transformer terminals. Using this fault current, all designs are analyzed with detailed stress calculations for worst case combinations of tap positions (LTC and DETC) for all known failure modes. These stresses are then compared to known strengths for each of the failure modes and must have acceptable design margins as set by SPX Waukesha.



MANUFACTURING

All windings are manufactured with rectangular, electrolytic-grade copper conductor or epoxy-bonded, continuously transposed cable (CTC). Radial spacers are locked to strips fastened to the winding cylinders. These radial spacers and other support blocks in the pressure column are manufactured from high density, pre-compressed pressboard or laminated wood. Other specialized components—angle/cap rings, coil collars and static ring insulation—are manufactured from molded grade, soft pressboard as required.

Fully Distributed Regulating Voltage Winding

After the windings are completed, they are thoroughly dried using hot air. After removal from the dryout chamber, coils are hydraulically pressed successively using a predetermined force then pressed again using the clamping force they will experience when fully assembled. When required, radial spacers are adjusted to achieve the required design height, maintaining the design's "electrical center" of the windings for ampere-turn balance, stray flux and axial force mitigation.

The coils are clamped in place by first applying a precise, hydraulic force which compresses the windings to the design height as verified in the coil sizing operation (as described in the paragraph above). In this condition, the coils are fastened in place to maintain a compressive force as specified by SPX Waukesha engineering. Verifying exact clamping pressure and winding height in this manner helps guarantee a finished product that conforms to what was designed in engineering.

The entire clamping technique and underlying scientific principles on which it is based are major contributors to the outstanding SPX Waukesha service record.

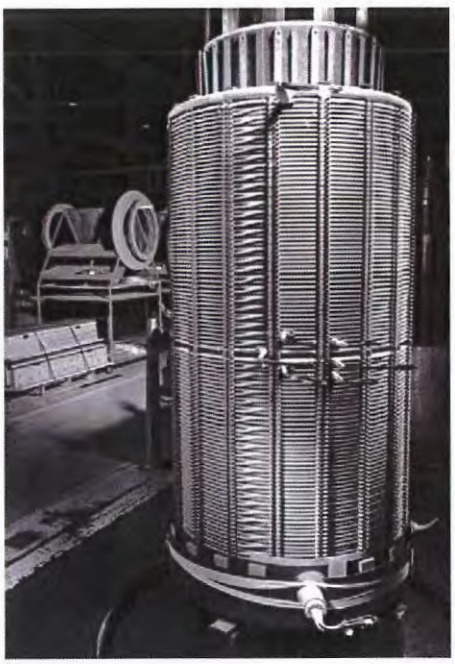
See next page for a list of transformers tested for short-circuit at high power laboratories.

SPX WAUKESHA SHORT CIRCUIT TEST LIST:

MVA RATING	HV RATING	LV RATING	MANUFACTURING PLANT LOCATION
0.833	67 kV Delta	12.47 kV Wye	Wisconsin
5 / 6.25	24.4 kV Delta	4.16 kV Wye	Wisconsin
5 / 6.25	26.4 kV Delta	4.16 kV Wye	Wisconsin
5 / 6.25	59.58 kV Wye	10.66 kV Wye	Wisconsin
5 / 6.25	67 kV Delta	12.47 kV Wye	Wisconsin
7.5 / 9.375	69 kV Delta	12.47 kV Wye	Wisconsin
7.5 / 9.375	138 x 69 kV Delta	26.4 X 13.2 kV Wye	Wisconsin
12 / 16 / 20	66 kV Delta	14.4 kV Wye	Wisconsin
15 / 20	67 kV Delta	12.47 kV Wye	Wisconsin
15 / 20 / 25	69 kV Delta	12.47 kV Wye	Wisconsin
1.0	12.47 kV Delta	4.8 kV Wye	North Carolina
3.75	23 kV Delta	4.8 kV Wye	North Carolina
5.0	34.4 kV Delta	12.47 kV Delta	North Carolina
5.0	69 kV Delta	12.47 kV Delta	North Carolina
7.5	23 kV Delta	12.47 kV Wye	North Carolina
7.5	115 kV Delta	13.2 kV Wye	North Carolina
10.0	43.8 kV Delta	24.9 X 12.47 kV Wye	North Carolina
5 / 6.2	34.5 kV Delta	12.47 kV Wye	California
15 / 20	67 kV Delta	12.5 kV Wye	California
15 / 20	67 kV Delta	12.5 kV Wye	California
15 / 20 / 25	120 kV Delta	13.2 kV Wye	California
15 / 20 / 25	120 kV Delta	13.2 kV Wye	California
18	39.5 kV Delta	4.8 kV Delta	California
30	230 kV Delta	55.2 kV Delta	California

Helical Winding with CTC

Continuous Disk Winding with Copper Magnet Wire



Goldsboro, NC 800.758.4384 | Waukesha, WI 800.835.2732 | www.spxtransformersolutions.com

TC07-1008A

SPX®

WAUKESHA® SERVICE

Transformer Service Solutions to 765kV

AVAILABLE FOR ALL MANUFACTURERS' UNITS

The Waukesha® Service team focuses on maintaining performance quality, reliability and life of transformers and load tap changers throughout your electric power system — whether manufactured by SPX Waukesha or other suppliers. Our mission is simple: to keep your transformers up and running with responsive and cost-effective service and maintenance support 24 / 7 / 365.

TRANSFORMER INSTALLATION & LOGISTICS

- Heavy Hauling
- Rigging
- Assembly
- Oil Filling
- Acceptance Testing
- Relocation

TRANSFORMER TESTING SERVICES

- Insulation Resistance
- Power Factor
- Transformer Turns Ratio
- Winding Resistance
- CT Testing
- Leakage Reactance
- Winding Excitation & Alarm Checks
- Gauge Calibration
- Sweep Frequency Response Analysis
- Dissolved Gas Analysis & General Chemistry Test
- Materials Analysis

TRANSFORMER MAINTENANCE

- Inspections
- Component Addition & Replacement
- Regasketing
- Leak Repairs
- Life Extension
- Oil Preservation System Upgrades
- Control Upgrades
- Retrofits

TRANSFORMER OIL PROCESSING

- Field Dry Out
- Vacuum Filling
- Hot Oil Processing
- Cryogenic Drying (Cold Traps)
- Fullers Earth Reclamation
- On-Line Dehumidification
- Natural Ester Retrofills

SPARE PARTS

- Bushings / Arresters
- Cooling Equipment
- Gauges / Controls
- Gaskets
- Transformer Health Products®
- LTC Parts

TRAINING SERVICES

- LTC Training
- Maintenance Training
- Testing Training
- Print Reading
- Oil Processing Training

LTC MAINTENANCE

- All Manufacturers
- Inspections
- Overhauls
- Upgrade Kits
- Filtration Installation
- Core Replacement
- Vacuum Retrofits

ENGINEERING SERVICES

- Condition Assessment Studies
- Life Assessment Studies
- Thermal Uprate Studies
- Component Retrofits
- Failure Analysis
- Feasibility Studies
- Technical Supervision

Contact us for additional information or quotation on our extensive range of services:

CALL **800-758-4384** | VISIT **www.waukeshaservice.com**

Emergency Service Available 24/7/365: 888-365-24X7

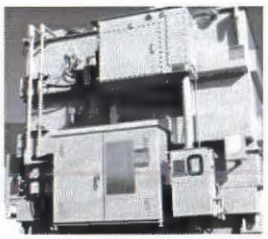
WAUKESHA®

2701 US HWY 117 SOUTH | GOLDSBORO, NC 27530-0915

TRANSFORMERS | SERVICE | TRAINING | COMPONENTS

SRV-065 (Rev. 4/12)

SPX®

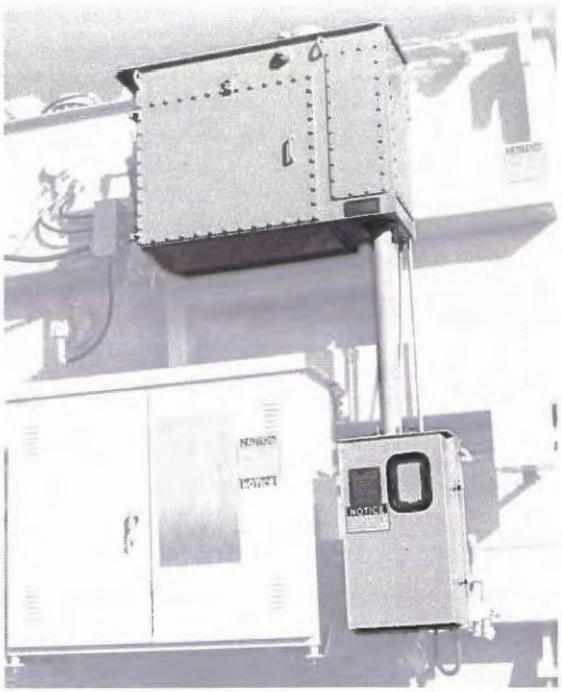


WAUKESHA® COMPONENTS

Waukesha® UZD®

THE SERVICE-PROVEN LOAD TAP CHANGER!

With more than 6,500 units installed, Waukesha's UZD Load Tap Changers boast an excellent field performance record. Design improvements made in the 1990s reduced the already low failure rate to one of the lowest in our industry, reduced maintenance costs and increased maintenance intervals. When compared to the cost of downtime, out-of-service operation and costly repairs, the UZD LTC system is a cost-effective way to keep your transformer operating as smoothly as the day it was installed!

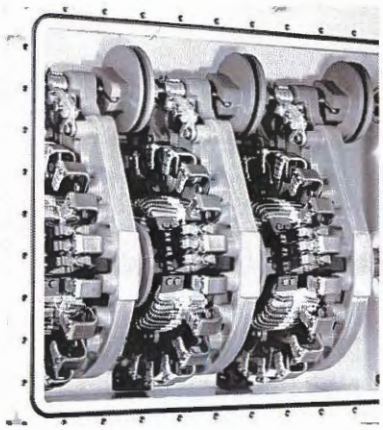


A load tap changer, regardless of manufacturer, is a complex engineered device with numerous moving parts requiring precise engineering, correct material selection and controlled manufacturing to operate reliably for a long period of time.

In many cases, the true reliability of a load tap changer becomes evident only when a transformer has been in service for several years and the load tap changer accumulates 100,000 plus mechanical operations.

Since the UZD's initial introduction in 1970, it has accumulated in excess of 110,000 YEARS of operational service and an estimated 550 MILLION switching operations. Ongoing continuous improvement programs, in coordination with our customers, resulted in several design enhancements that help increase overall operational life as well as virtually eliminate a need to perform maintenance inside the oil compartment.

KEY ADVANTAGES OF THE WAUKESHA® UZD® LOAD TAP CHANGER



Re-Engineered Reversing Switch and Current Collector ("Bow-tie") System
Since the re-engineered reversing switch and current collector system were introduced in 1997, no known failures due to coking have occurred.

Silver-Plated Copper Contacts with Tungsten Copper Inserts
Stationary contacts for long life and low temperature rise.

Resistive Bridging
High-speed operation results in extremely low contact wear and manageable levels of arcing by-products. For optimal results, we recommend applying an oil filtration system.

LTC and Series Transformer System
For applications with greater than 600 ampere current ratings, a series transformer is recommended to allow for an optimal volts/turn design of the main transformer windings, even step regulation and smaller leads while facilitating a reduction in current through the LTC contacts for less contact wear and longer life; a power-class series transformer design is recommended for high reliability.

Spring Drive Mechanism
Stored energy system delivers split-second operation for minimum arcing time; in addition, each tap change is uniform and unaffected by possible auxiliary voltage fluctuations.

OTHER NOTABLE FEATURES OF THE WAUKESHA® UZD® LTC

Single Set of Spare Contact Parts

Due to the design flexibility of the series transformer, we utilize a single model LTC across a wide range of transformer voltage and power ratings.

Easy to Maintain with Few Moving Parts

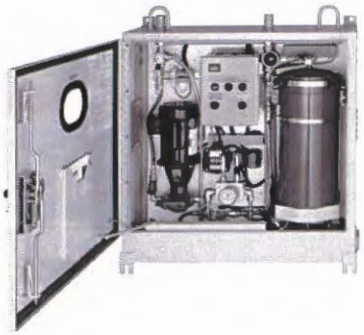
A single collector arm incorporates both the arcing contacts and tap selector contacts which reduces linkages, wear points and potential maintenance.

RECOMMENDED ACCESSORIES

Clean, dry oil increases dielectric strength, thereby reducing arcing time. The accessories below help keep carbon particles, metal particles and moisture out of tap changer oil:

OF2 Oil Filtration System

Designed to remove carbon and metallic particles produced during normal LTC operation. The system includes an adjustable timer for customized configuration and a 1/2 HP, fully enclosed, continuous run rated, auto-thermal resetting motor.



Another feature of the OF2 is a tilt-out, tool-free filter replacement system which allows the filter cartridge to be changed without disconnecting oil lines or reversing the pump—dirty oil stays in the filter while LTC compartment oil stays clean. Additionally, our OF2 ships standard with a unique, high-efficiency, depth-type filter that offers long element life and provides the capability to filter more efficiently than pleated-type models. The system is also adaptable to a variety of industry standard filters. Other features include low flow and high pressure alarms, anti-condensation cabinet heater and remote system shut down relay.

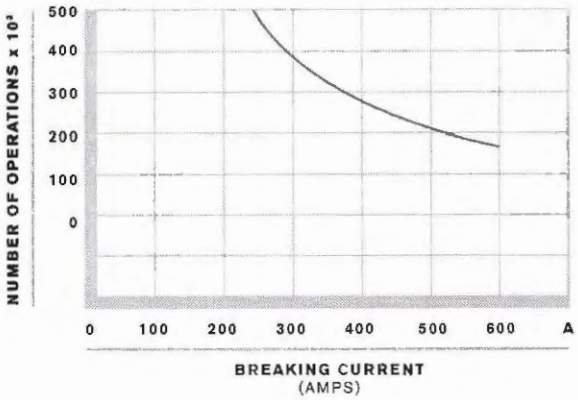
ARDB2 Auto-Recharging Dehydrating Breather

Automatic recharging of silica gel maintains peak drying performance and reduces maintenance costs by eliminating the need for periodic replacement/disposal of saturated silica gel.

CONTACT LIFE

Predicted contact life of the selector switches' fixed and moving contacts is shown below. Since most transformers are not consistently operated at maximum nameplate rating, some tap changes will be made at lower currents. These lower currents allow for less contact erosion due to arcing, so contact life may be longer than what is illustrated on this curve.

PREDICTED CONTACT LIFE WITH BREAKING CURRENTS



WAUKESHA® UZD® LOAD TAP CHANGER

System Designed for High Reliability and Low Total Operating Costs

- Economical LTC solution to total transformer cost
- Well accepted in the US market
- Now available for sale to transformer manufacturers

Contact us for more information. To download an order form, technical manual, field maintenance manual and/or technical paper, visit our website.

CALL **800-338-5526**
VISIT **www.waukeshacomponents.com**

WAUKESHA®

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SPX®

TRANSFORMER® HEALTH PRODUCTS

WAUKESHA® COMPONENTS

2ND GENERATION

Load Tap Changer Oil Filtration Systems

REDUCE OIL-RELATED MAINTENANCE COSTS AND IMPROVE RELIABILITY

Our second generation oil filtration systems are designed to be installed on most LTC models to remove carbon and metallic particles produced during normal LTC operation, keeping oil in peak condition with minimal maintenance.

For flexible operation, the system includes an adjustable timer which allows customers to configure the system to their specifications — daily, every other day, weekly or every other week in intervals of two, four, eight and 24 hours. Since filter replacement does not require pump reversal OR any disconnection of oil lines, the dirty oil stays in the filter while system oil stays clean and in peak condition (a convenient filter canister drain valve is included).

2ND GENERATION OIL FILTRATION SYSTEM: OF2

Easier to Install and Maintain

Our standard OF2 system's design allows for easy installation and is equipped with a swing-out filter canister that makes filter replacements a quicker task.

Unique High-Efficiency Filter Design with Tilt-Out Easy Filter Change System

Our depth-type filter uses a flow path parallel with the center tube instead of the conventional outside-to-inside flow. This flow path forces oil through a greater depth of filter material for more efficient filtration. See back side for more information on this unique filter design and photo to the right demonstrating easy filter change-out process.

Minimum Turbulence in Reservoir

Pump maintains a flow rate of 1.0 GPM to minimize turbulence in the tank.

Filter Adapter Kit Available for Alternate Style Manufacturer Cartridges

More Economical

High efficiency filter reduces LTC mechanical wear which can minimize equipment failure and downtime. Economical purchase price combined with less frequent filter replacement can save you money.*

** Actual filter life varies depending on transformer loading and frequency of LTC operations and tap changer model.*

Customizable 2nd Generation Oil Filtration System: OF2

SEE BACK SIDE FOR PART NUMBER CONFIGURATION TOOL.

CUSTOMIZE YOUR OWN SYSTEM

The OF2 oil filtration system has been designed to meet the filtration demands of higher oil volume load tap changers while providing customization flexibility to meet individual customer specifications. The system is adaptable to a variety of industry standard filters and always ships complete with the following:

- 1/2 HP, fully enclosed, continuous run rated, auto-thermal, resetting motor
- High performance depth filter
- 5+ gallon leak-catch sump with sump alarm
- Low flow alarm
- High pressure alarm
- Anti-condensation cabinet heater
- Tilt-out, tool-free filter change system
- Visual flow indicator which can be monitored without opening the cabinet
- 0–160 psi, oil-filled pressure gage
- Customer selectable run-time and interval timer
- Run-time bypass switch
- Remote system shut down relay
- Heavy duty circuit breaker on incoming power
- 120 VAC operation

OPTIONAL FEATURES

- 240 VAC Operation
- Alternate Filter Selection
- Additional 4–20 mA Flow Transmitter
- Additional 4–20 mA Pressure Transmitter
- Filter Canister Heater System
- LTC Entrance Tube with or without Hose
- Stainless Steel Cabinet

Particle/Moisture removal performance is dependent on make/model of customer-specified oil filter cartridge.

With the appropriate filter installed, the OF2 system can remove dissolved water, extremely fine carbon and metallic particles to maintain peak performance of LTC oil, extend the life of your equipment and lengthen the period between maintenance intervals.

Build Your Own Part Number Using Configuration Below

Oil Filtration Systems

O	F	2	-	X	X	X	X	X	X	X

SYSTEM TYPE

STANDARD SYSTEM (120VAC) STEEL NEMA 3R CAB 1/2 HP MOTOR 5 GAL LEAK SUMP OIL LEAK DETECTION TILT OUT FILTER CANISTER VISUAL FLOW INDICATOR 0-100 PSI, OIL FILLED, GAGE RUN INTERVAL TIMER RUN TIMER BYPASS SWITCH RUN-TIME METER REMOTE SHUTDOWN AUTO RESTART WITH POWER FAILURE (1030-1393 CAB.)	A
SAME AS OPTION "A" EXCEPT WITH STAINLESS STEEL CAB (1030-1656 CAB.)	B
SAME AS OPTION "A" EXCEPT FOR 240VAC OPERATION 240VAC - 120VAC TRANSFORMER CONVERSION WIRING	C
SAME AS OPTION "A" EXCEPT WITH STAINLESS STEEL CAB & 240VAC OPERATION 240VAC - 120VAC TRANSFORMER CONVERSION WIRING	D

PUMP CAPACITY

1 GAL PER MIN. MECH. SEALS INTEGRAL BYPASS	0

FILTER PACKAGE

WAUKESHA STAN. 7 X 18 DEPTH COMO ELEMENT 1030-1508	0
7 X 18 DEPTH COMO ELEMENT -D 1030-1542	1
7 X 18 DEPTH FILMAX ELEMENT 1030-1385	2

LOW FLOW / LEAK ALARMS

STANDARD LOW FLOW & LEAK DETECTION WITH LOCAL LED INDICATOR AND ALARM CONTACTS	0
SAME AS OPTION "0" EXCEPT WITH FLOW TRANSMITTER (4-20 ma) 1030-1530	1

HIGH PRESSURE ALARMS

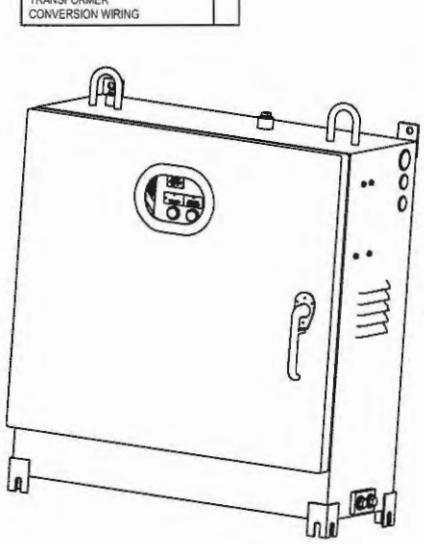
STANDARD HIGH PRESSURE DETECTION WITH LOCAL, WINDOW VISIBLE, LED INDICATOR SYSTEM SHUTDOWN, AND ALARM CONTACT	0
SAME AS OPTION "0" EXCEPT WITH PRESSURE TRANSMITTER (4-20 ma)	1

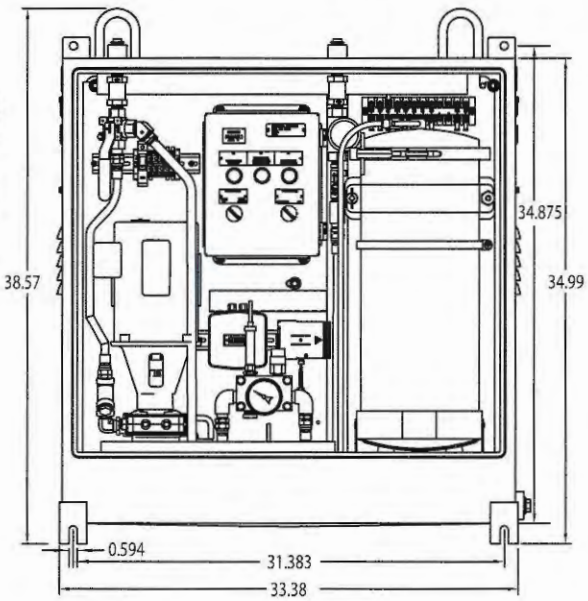
AMBIENT TEMPERATURE RANGE

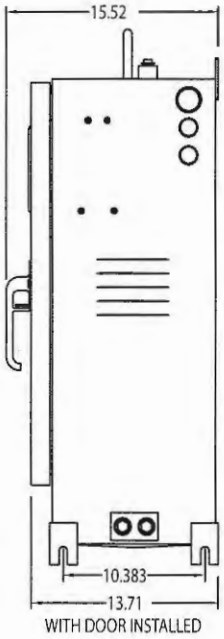
-50° C TO 50° C AMBIENT HI-RECOVERY 200/400W ANTI-CONDENSATION HEATING	0

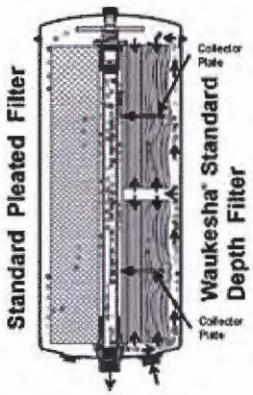
PIPING

NONE	0
ENTRANCE TUBE ONLY 1030-014K	1
ENTRANCE TUBE AND HOSE 1030-048K	2









WAUKESHA® STANDARD FILTER OFFERS LONG FILTER ELEMENT LIFE

SPX Transformer Solutions' depth-type filter element (in Standard OF2 System) features a unique fluid flow path: fluid runs parallel with the center tube (axial flow) rather than the conventional outside-to-inside flow (radial flow) of most pleated-type filters. The depth of fluid flow is optimized and provides the capability to filter more efficiently than pleated-type filters. Filter media is constructed as four rolls of filter paper. Oil flows between the layers of media until it reaches one of two collector plates. The collector plates route oil to the center of the element where it is discharged out of the element. The depth filter media has a much greater resistance to flow from outside to center (radial flow) than it does between the layers (axial flow) of filter material. Integrity of the filter element is maintained even as it accumulates contaminants and the Delta-p (pressure across the filter) goes up. Hydraulic pressure of the fluid compressing the layers of media together prevents a channel from forming that could allow oil to pass through the element unfiltered.

REMOVES BOTH DIRT AND MOISTURE

- Filter material is dried cellulose fiber
- Optional –D filter can decrease water to under 5 PPM with multiple passes
- Micron rating: 1.0
- Rated for particles as well as free and emulsified water
- Total water holding capacity: 0.5 kg
- Beta X rating: >25 at 3 microns
- High rate of absorption enables oil to be reduced from 200 to less than 25 PPM in one pass using the optional –D filter element

WAUKESHA®

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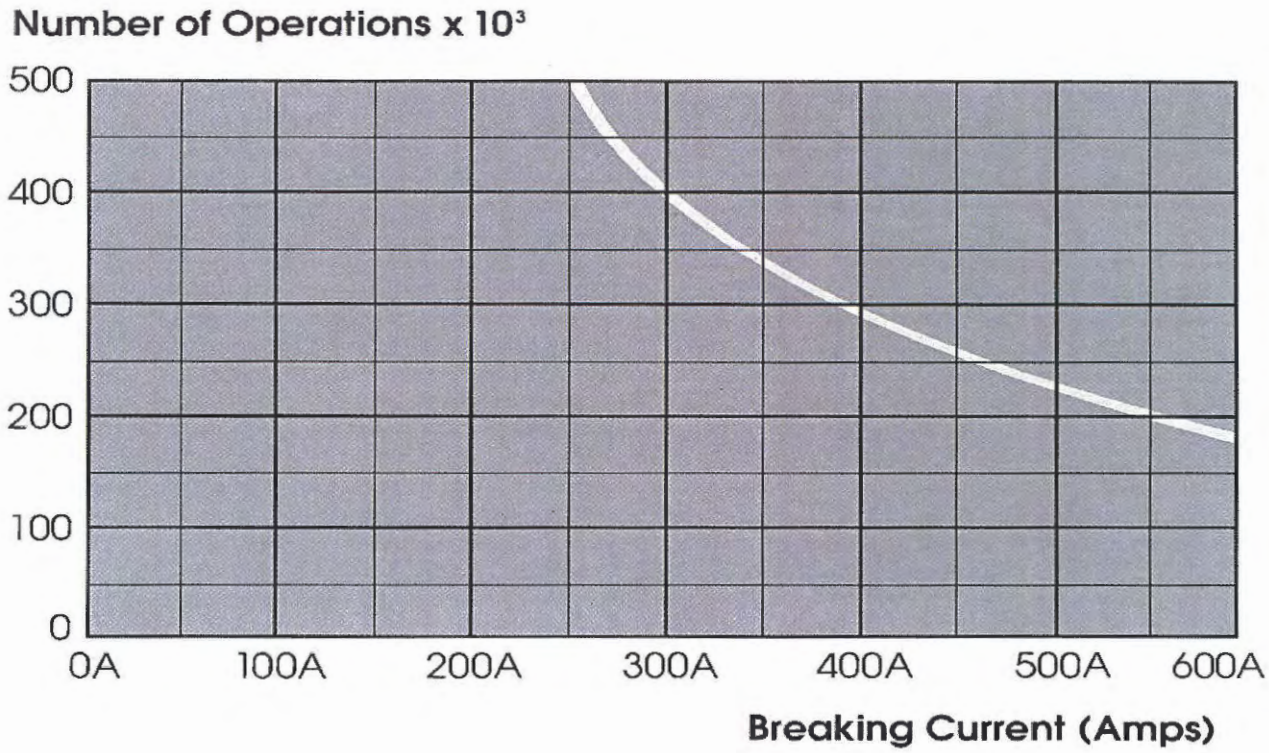
WAUKESHA® UZD CONTACT LIFE CURVE



SPX
TRANSFORMER SOLUTIONS

Performance Specification

FOR: 1105 DANVILLE POWER & LIGHT

Quotation No: 70004100 **Item No:** 000010 **Project Name:** 18/24/30 MVA Transformer

TRANSFORMER RATINGS

Phase	3
Frequency	60
Temp Rise ^{O}C	65
Insulating	Oil

Cooling	HV Volts		XV Volts		YV Volts		ZV (TV) Volts	
Class	69,000	--	12,470	--	--	--	--	--
	Delta	--	Wye	--	--	--	--	--
ONAN	18.00	--	18.00	--	--	--	--	--
ONAF	24.00	--	24.00	--	--	--	--	--
ONAF	30.00	--	30.00	--	--	--	--	--

ADDITIONAL TAP VOLTAGES

Terminal	Style	Taps or KV	Capacity
HV	DETC	+ 2 / - 2 @ 2.500 %	FULL
XV	UZD	+ 16 / - 16 @ 0.625 %	REDUCED

PERCENT IMPEDANCE VOLTS

%	Windings	At MVA
8.50	H-X	18.0
--	H-Y	--
--	X-Y	--

AUXILIARY LOSSES AND SOUND LEVEL

MVA	Class	Cooling	Sound Level dB
18.00	ONAN	--	71
24.00	ONAF	900	73
30.00	ONAF	1,800	74

The above values for cooling loss do not include ancillary equipment (heaters, control devices, etc.) losses of 2,000 watts

INSULATION LEVELS (KV)

Terminal	Winding		Bushing
HV Line	350	--	350
HV Neutral	--		--
XV Line	110	--	110
XV Neutral	110		110
YV Line	--	--	--
YV Neutral	--		--
ZV (TV) Line	--	--	--
ZV (TV) Neutral	--		--

PERFORMANCE BASED ON A LOADING OF

HV Winding	69,000	Volts @	18.00	MVA
XV Winding	12,470	Volts @	18.00	MVA
YV Winding	--	Volts @	--	MVA
ZV (TV) Winding	--	Volts @	--	MVA

EFFICIENCIES Base MVA (ONAN) = 100%

Load	100%	75%	50%	25%
Percent	99.53	99.61	99.66	99.61

REGULATION

Power Factor	Percent Regulation
1.0	0.75
0.9	4.33
0.8	5.61

PERFORMANCE_DATA No Load Temp: 20 ^{O}C/ Load Loss Temp: 85 ^{O}C

Exciting Current (Percent) and Loss (Watts)

Excitation	Exciting Current(%)	No Load Loss	Load Loss	Total Loss
100%	.500	13,000	71,300	84,300

MECHANICAL DATA - Not for Construction

Dimensions are in inches & weights are in pounds (approx.values)

Outline Drawing Number:

Shipping: Dry by Truck

	Base	Assembled	Shipping
Height (A)	--	174	144
Width (B)	170	191	191
Depth (C)	78	186	108
Height Over Cover (D)	--	144	144

	Weight (lbs)
Core and Coils	54,825
Tank and Fittings	32,313
Liquid (5,550 gallons)	41,625
Total Weight	128,763
Shipping Weight, Heaviest Piece	77,886

WAUKESHA®